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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,806	08/08/2006	Bernhard Kneer	18239-023US1 10709.5	6572

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EXAMINER

ASFAW, MESFIN T

ART UNIT	PAPER NUMBER
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2851

NOTIFICATION DATE	DELIVERY MODE
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04/15/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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PATDOCTC@fr.com

Office Action Summary	Application No. 10/597,806	Applicant(s) KNEER ET AL.	
	Examiner Mesfin T. Asfaw	Art Unit 2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-5, 7-14, 23-27 and 31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-5, 7-14, 23-27, 31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Acknowledgment is made to the amendment filed 02/02/2009. Claims 2, 7, 26 and 31 have been amended. Claims 1, 6, 15-22, 28-30 and 32 have been cancelled. Accordingly, claim Objection made in the first office action is withdrawn. Claims 2-5, 7-14, 23-27 and 31 are pending.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 2-5 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Santen [WO 2004057590 A1].

As per Claims 23-25, Van Santen teaches a projection objective of a microlithographic projection exposure apparatus (See fig. 6, page 10 line 32 – page 11 line 4) for imaging a mask (reticle 17) on a photosensitive layer 5 (page 8 lines 20-26) that is disposable in an image plane 12 of the projection objective, wherein the projection objective is designed for immersion operation in which an immersion liquid 91 adjoins the photosensitive layer, and wherein

the immersion liquid 91 forms an interface with a medium 59 that adjoins the immersion liquid on the object side of the projection objective, said interface being convexly curved towards the mask (See fig. 2).

Van Santen does not specifically state that the maximum radius of curvature equals the product $m \times s$, wherein s is the axial distance between the interface and the image plane and m is a real number between 20 and 120.

However, Van Santen also teaches the curved image-side surface occupied by the space 53 is ranged preferably to be 3-1500 μm and more preferably 3-500 μm where this value can be changed depending on the viscosity of the liquid to be used as a medium (page 9, lines 4-19). Further, Van Santen discloses the claimed invention except for expressing the maximum radius of curvature to be equal the product of $m \times s$, wherein s is the axial distance between the interface and the image plane and m is a real number between 20 and 120.

It would have been obvious to one having ordinary skill in the art at time the invention was made to make (or to express) the maximum radius of curvature to be equal the product of $m \times s$, wherein s is the axial distance between the interface and the image plane and m is a real number between 20 and 120, since it has been held that where the general conditions of a claim are disclosed in the prior art (where the general condition of the claim is the concave nature of the shape of the interspace 53 on the object side, and the advantage of using a particular size to create the condition for the imaging light to be focused towards the substrate), discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Please note that in the instant application, Claim 23, Applicant has not disclosed any criticality for the claimed limitations.

As per Claims 2 and 5, Van Santen teaches the immersion liquid 91 directly adjoins, during immersion operation, a concavely curved image-side surface 63 of an optical element 59 that is the last optical element of the projection objective 61 on the image side, wherein the curved image-side surface is spherical (See fig. 2, page 8 lines 8-26).

As per Claims 3-4, Van Santen teaches the curved image-side surface is surrounded by a drainage barrier (See fig. 2 (65), Page 13 lines 7-14).

3. Claims 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Santen as applied in Claim 23 above, in view of Omura et al. [US 20050248856 A1, hereinafter referred as Omura].

As per Claims 26-27, Van Santen teaches a microlithographic projection exposure apparatus (See fig. 6, page 10 line 32 – page 11 line 4).

Van Santen does not specifically teach the projection objective is a catadioptric objective that has at least two imaging mirrors and in which at least two intermediate images are formed.

Omura teaches the projection objective is a catadioptric objective that has at least two imaging mirrors and in which at least two intermediate images are formed (Para 16).

Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at the projection objective with a catadioptric objective

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that has at least two imaging mirrors and in which at least two intermediate images are formed for the purpose of small-field system (Para 16).

4. Claims 7-13, 14 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Santen in view of Omura and Coon et al. [US 20070268468 A1, hereinafter referred as Coon].

As per claims 7-13, Van Santen teaches an immersion liquid medium between the last optical element and the substrate which forms a curved interface with the last optical element of the projection.

Van Santen does not specifically teach an intermediate liquid which is not miscible with the immersion liquid which is formed between the last optical element and the immersion fluid.

Omura teaches two separate space between the last optical element Lb and W, separated by an element Lp and they are not miscible (Para 163).

Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at an intermediate liquid of a different refractive index and characteristics, which is not miscible with immersion liquid, in order to get a better focus and a greater image resolution.

Van Santen in view of Omura teaches an intermediate liquid, which is not miscible with the immersion liquid and which forms a curved interface with the last optical element of the projection lens.

Van Santen in view of Omura does not teach an intermediate liquid, which forms a curved interface in an electric field.

Coon teaches an immersion liquid in an electric field (See fig. 7-8).

Thus, it would have been obvious, to one of ordinary skill in the art, at time the invention was made, to arrive at an intermediate liquid, which is not miscible with the immersion liquid and which forms a curved interface in an electric field in order to get a very high viscosity to control the flow of the liquid (See fig. 7-8, Para 38-39).

As per Claim 14, Van Santen teaches the interface between the intermediate liquid and the immersion liquid is at least approximately spherical (See fig. 2).

As per Claim 31, Van Santen in view of Omura and Coon teaches the method as claimed, because under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claims, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. In re King, 801 F.2d 1324,231 MPEP 2112.02”

Response to Arguments

5. Applicant's arguments filed 02/02/2009 have been fully considered but they are not persuasive.

6. In the Remark section page 6 Para 3, Applicant argued that Van Santen provides no discussion regarding the maximum radius of curvature of an interface between an

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immersion liquid and a medium that adjoins the immersion liquid on the object side of a projection objective. The Examiner respectfully disagrees.

Van Santen on page 9 teaches the general condition of the claim which is the concave nature of the shape of the interspace 53 on the object side, and the advantage of using a particular size to create the condition for the imaging light to be focused towards the substrate. Van Santen expressed the teaching as "A presently preferred range for the smallest thickness of the interspace 53 (See fig. 2) is 3-1500 μm and more preferably 3-500 μm if the liquid is water larger values for the smallest thickness of the interspace can be particularly advantageous if the liquid has a larger viscosity than water. Also the overall width of the outflow opening affects the upper end of the preferred range for the smallest thickness of the interspace, the smallest thickness of the interspace being preferably smaller than $(100 + 1/20 * W)$ μm in which W is the overall width of the outflow opening measured in a plane parallel to the layer 5. The smallest thickness of the interspace may be larger than approximately 10 μm , for instance larger than 15 μm , 30 μm or even 100 μm , to increase the insensitivity to tolerances", the thickness of the interspace 53 is directly related to the value of the radius curvature of an interface between an immersion liquid and a medium that adjoins the immersion liquid on the object side, to find an optimum or a workable range of radius value may depend in a particular condition such as the immersion liquid or the lens material type. Therefore, Applicant's argument on this point is not persuasive.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mesfin T. Asfaw whose telephone number is 571-270-5247. The examiner can normally be reached on Monday to Friday, 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on 571-272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mesfin T Asfaw/
Examiner, Art Unit 2851

/Diane I Lee/
Supervisory Patent Examiner, Art Unit 2851